NUMERICAL PREDICTION OF CURING STATUS OF GRAPHITE-BASED TIRE COMPOUNDS UNDER VULCANIZATION

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The solid tire construction consists of three layers namely tread, center and base. Solid tires are used in heavy applications under mechanical loadings. External and internal heat generation in the center region are caused by hysteresis and with the heat due to friction from tread; should be relieved promptly to reduce tire blowouts and tire layer separation. The of this study is to enhance the properties of the solid tire using Sri Lankan vein graphite powder as a filler. The results show an increase in thermal conductivity of tires. As for current trend, to predict the curing status, tire industries are searching for alternatives based on finite element modelling of the process. A finite element approach is thought to offer greater accuracy and versatility than a finite difference method, taking into consideration the complicated geometry and multi-layered structure of a tire.

The coupled heat transfer and cure problem can be resolved using a user subroutine a commercial finite element code called ABAQUS. Thermal conductivity and heat capacity of the rubber are assumed to be dependent on temperature. In this paper tire curing simulation was developed based on finite element analysis. The model demonstrates its potential to significantly improve the efficiency and quality of tire manufacturing processes. Our research represents a pioneering contribution to the understanding of the curing behavior of graphite-based tire compounds and provides a valuable tool for optimizing tire manufacturing processes.

Keywords: Rubber Curing, Simulation, Finite Element Method, Computer Code, Cure Kinetics, Thermal Properties